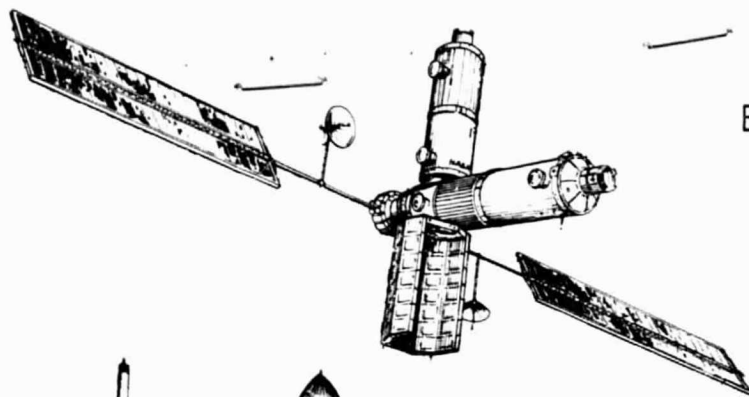


General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

MID-TERM REVIEW
EXECUTIVE OVERVIEW
15 NOVEMBER 1982
COPY NO. 8



(NASA-CR-173707) SPACE STATION NEEDS,
ATTRIBUTES AND ARCHITECTURAL OPTIONS:
MIDTERM REVIEW, EXECUTIVE OVERVIEW (Lockheed
Missiles and Space Co.) 53 p HC A04/MF A01

N84-27818

Unclas
00952

CSCL 22B G3/18



NASA

Space Station Needs, Attributes and Architectural Options

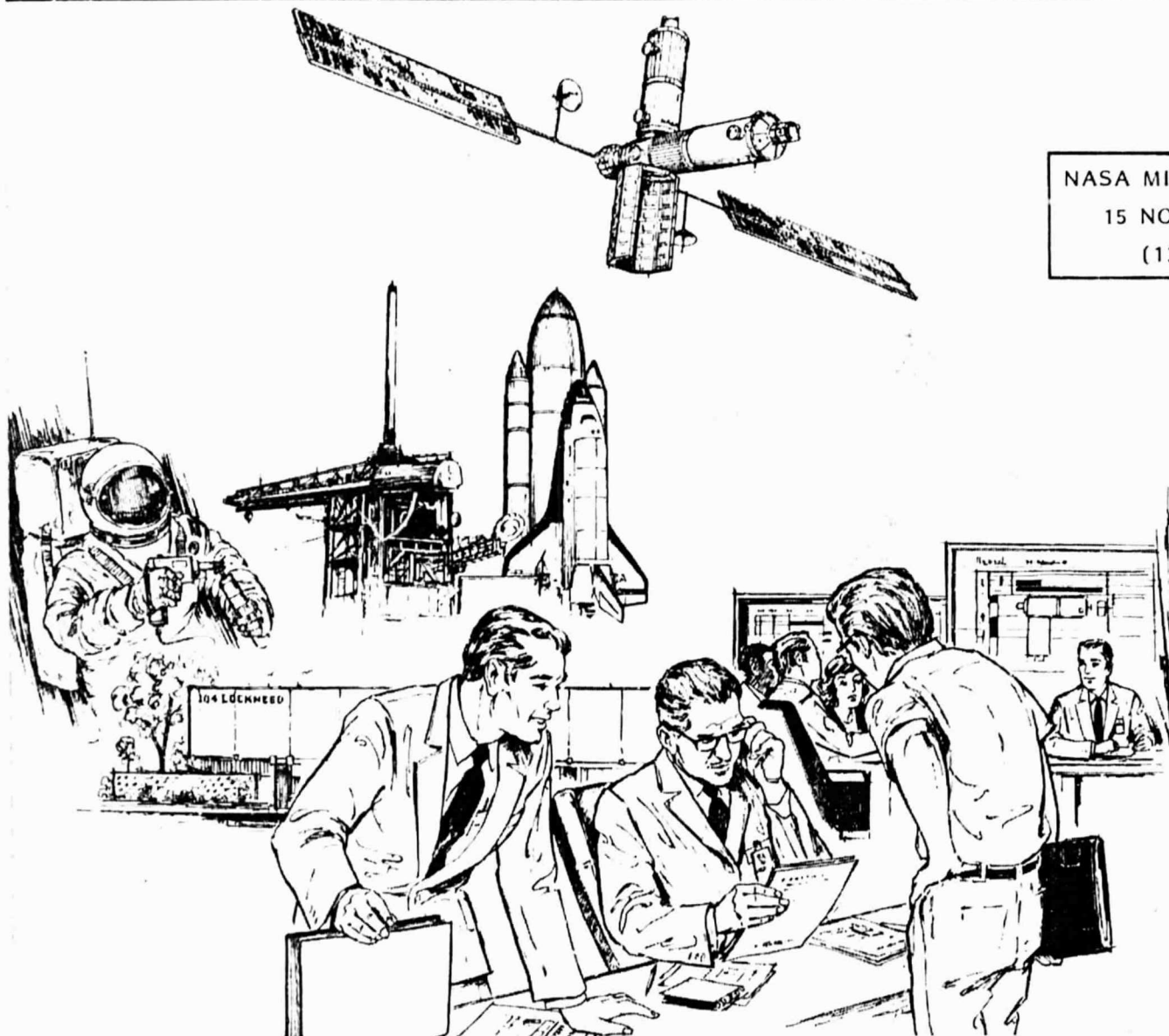


 Lockheed Missiles & Space Company, Inc.

NASA

Space Station Needs, Attributes and Architectural Options

NASA MID TERM REVIEW
15 NOVEMBER 1982
(1330 - 1730)



ORIGINAL PAGE IS
OF POOR QUALITY

SPACE STATION USER NEEDS



LOCKHEED APPROACH

- USER CONTACT PLAN HAS BEEN IMPLEMENTED JUST AS PROPOSED
 - SMALL GROUPS, REPEAT VISITS, BROAD BASE
 - EXISTING DATA BANK IS PROBABLY ADEQUATE TO DEFINE 90% OF STATION REQUIREMENTS
- THUS-
- SEVERAL HUNDRED VALID MISSION SCENARIOS COULD BE CONSTRUCTED
UTILIZING EXISTING DATA BANK INDEPENDENT OF USERS
- INSTEAD-
- OUR APPROACH IS TO DEVELOP 10 TO 15 VALID MISSIONS AND OBTAIN
SOLID, MULTIPLE USER CONCURRENCE
- NASA DATA FORMAT IS BEING USED — BUT IT ASKS FOR MORE THAN NECESSARY
DETAIL AT THIS STAGE
 - ARCHITECTURAL OPTIONS WILL BE STUDIED, BUT DEVELOPMENT OF
DETAILED DESIGNS IS BEING DELIBERATELY AVOIDED

RECORDING PAGE BLANK NOT FILLED

11-15-82

- 4 -

SPACE STATION USER NEEDS

 Lockheed

USER CONTACT PLAN WORKS!

VISITS AND REVISITS OF POTENTIAL USERS HAS INCREASED
THEIR INTEREST AND A PERCEPTIBLE MOMENTUM IS DEVELOPING
TO SUPPORT A SPACE STATION

SPACE STATION USER NEEDS

MID-TERM REVIEW AGENDA
15 NOVEMBER 1982 (1330 - 1730 HRS)

1. EXECUTIVE OVERVIEW	FORSBERG	1:30 - 2:10
2. STUDY ACTIVITY AND STATUS		
TASK 1 - MISSION REQUIREMENTS (NASA and DoD)	FORSBERG	2:10 - 2:15
1.1 USER ALIGNMENT PLAN		
1.1.1 SCIENCE AND APPLICATION	OLCOTT	2:15 - 2:35
1.1.2 COMMERCIAL	GLASER	2:35 - 3:05
1.1.3 U. S. NATIONAL SECURITY	(SEE ITEM 5)	
1.1.4 SPACE OPERATIONS	D. SMITH	3:05 - 3:35
1.2 REQUIREMENTS FROM USER NEEDS		
- B R E A K -		
TASK 2 - MISSION IMPLEMENTATION CONCEPTS	HEKKING	3:45 - 4:15
TASK 3 - COST AND PROGRAMMATIC ANALYSIS	HOPKINS	4:15 - 4:35
3. STATUS/CONCLUSIONS/OBSERVATIONS	FORSBERG	4:35 - 4:45
4. PLAN TO COMPLETION		
5. U. S. NATIONAL SECURITY (SECURITY)	FORSBERG/ P. SMITH	4:45 - 5:30

11-15-82

- 6 -

SPACE STATION USER NEEDS

 Lockheed

EXECUTIVE OVERVIEW



SPACE STATION USER NEEDS



STUDY OBJECTIVES

- TO CREATE USER SUPPORT FOR THE SPACE STATION
- TO IDENTIFY USERS IN AREAS NOT CONTACTED BEFORE
- TO GAGE THE "POTENTIAL USER" CLIMATE IN REGARD TO SPACE STATION START-UP IN FIVE AREAS (PER S.O.W.)
 - SCIENCE
 - APPLICATIONS
 - COMMERCIAL
 - U.S. NATIONAL SECURITY
 - SPACE OPERATIONS
- TO DEFINE USER REQUIREMENTS
- TO ESTABLISH TIME-PHASED ARCHITECTURE FOR OPTIMAL DEVELOPMENT/ INTEGRATION/OPERATION OF A SPACE STATION

SPACE STATION USER NEEDS



PRECEPTS

- SPACE STATION IS NOT AN END IN ITSELF
- ITS PURPOSE IS TO FACILITATE USE OF SPACE
- USER REQUIREMENTS ARE PARAMOUNT
- WE MUST ANSWER THE QUESTIONS
 - WHY A SPACE STATION?
 - WHY MANNED?

SPACE STATION USER NEEDS

GENERAL FINDINGS FROM USER SURVEY

- THERE IS INCREASING INTEREST IN SPACE STATION
- THERE IS WILLINGNESS TO HELP, BUT USERS EXPRESS
 - CONCERN ABOUT BUDGET (AFRAID TO COMMIT)
 - CONCERN ABOUT NASA OBJECTIVITY
 - CONCERN ABOUT NEED FOR MAN IN SPACE BEYOND SHUTTLE (MIXED REACTION)
 - CONCERN ABOUT BEING BEHIND IN SPACE ACTIVITY
- USER INTERACTION IS VITAL TO THE PROGRAM
- NO NEW SPACE STATION FUNCTIONS HAVE BEEN IDENTIFIED - BUT MISSIONS MUST BE RESTATED IN TERMS OF USER NEEDS
- SUPPORT FOR MISSION SCENARIOS NOW BEING RECEIVED (PARTICULARLY FROM DoD)

SPACE STATION USER NEEDS

**TASK 1 — MISSION REQUIREMENTS
(NASA AND DOD)**

**TASK 2 — MISSION IMPLEMENTATION
CONCEPTS**

**TASK 3 — COST AND PROGRAMMATIC
ANALYSIS**



SPACE STATION USER NEEDS



STUDY SCHEDULE

	1982				1983			
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
MAJOR MILESTONES	START OF CONTRACT ▽	ORIENTATION MEETING ▽	MID-TERM REVIEW ▽	FINAL REVIEW ▽	PRELIM STUDY REPORT ▽	FINAL STUDY REPT ▽		
<u>TECHNICAL EFFORT</u>								
TASK 1 - MISSION REQUIREMENTS (NASA AND DOD)								
TASK 2 - MISSION IMPLEMENTATION CONCEPTS								
TASK 3 - COST AND PROGRAMMATIC ANALYSIS								

OF POOR QUALITY

11-15-82

- 12 -

SPACE STATION USER NEEDS

TASK 1 MISSION REQUIREMENTS

 *Lockheed*

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS — PHYSICAL SCIENCES — LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

THE BULK OF THE EFFORT DURING THE FIRST HALF OF THIS CONTRACT WAS DEVOTED TO THIS TASK IN ACCORD WITH OUR PROPOSED PLAN.

11-15-82

- 14 -

SPACE STATION USER NEEDS




TASK 1.1 - USER ALIGNMENT PLAN

- SMALL GROUP APPROACH - DISCIPLINE ORIENTED
 - FOLLOW-UP CONTACT CONCEPT
 - EMPHASIZE NATIONAL SECURITY AND COMMERCIAL
- SCIENCE CONTACTS (PRIMARILY THROUGH NASA)
 - APPLICATIONS (OVERLAP WITH COMMERCIAL AND SCIENCE)
 - OPERATIONS/LOGISTICS SUPPORT INTEGRAL TO ALL CATEGORIES
 - FOREIGN CONTACTS (EXPRESSING CONSIDERABLE INTEREST)
 - INFORMATION FROM CONTACTS ENTERED INTO COMPUTERIZED DATABASE
 - SEMINAR TO EDUCATE HIGH LEVEL COMMERCIAL INTERESTS

11-15-82

- 15 -

SPACE STATION USER NEEDS

 Lockheed

TASK 1.1 - USER ALIGNMENT PLAN USER CONTACTS

SCIENCE AND APPLICATIONS

NASA

USDA

USDI

SELECTED MEMBERS OF
INDUSTRY AND
UNIVERSITY SCIENTIFIC
COMMUNITY

COMMERCIAL

FOREIGN SCIENCE ATTACHÉS

COMMUNICATIONS

MATERIAL PROCESSING

MEDICAL

SERVICES (LAB RENTAL)

FINANCIAL

U.S. NATIONAL SECURITY

AIR FORCE

NAVY

ARMY

DARPA

DIA

OSD

OSAF

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS

— PHYSICAL SCIENCES

— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS



SPACE STATION USER NEEDS



TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS PHYSICAL AND LIFE SCIENCES

COMPLETED

• NASA HEADQUARTERS	16
• NASA AMES RESEARCH CENTER	11
• NASA JOHNSON SPACE CENTER	15
• NASA MARSHALL SPACE FLIGHT CENTER	6
• NASA KENNEDY SPACE CENTER	5
• UNIVERSITIES	11
• RESEARCH INSTITUTES	3

TO BE COMPLETED

• NASA	~6
• AIR FORCE	~4
• UNIVERSITIES	~6
• ADVISORY COMMITTEES	~4
• JPL	~2

11-15-82

- 19 -

SPACE STATION USER NEEDS

 Lockheed

TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS PHYSICAL SCIENCE SUMMARY

- EXISTING NASA STUDIES ARE THE PRIMARY DATABASE FOR USER REQUIREMENTS
- MISSION PRIORITIES ARE DERIVED FROM NASA LIST OF CANDIDATE MISSIONS
- DATABASE VALIDITY AND COMPLETENESS IS BEING VERIFIED BY SELECTED USER INTERACTIONS
- TRY TO AUGMENT EXISTING DATABASE WITH INNOVATIVE CONCEPTS THAT REQUIRE SPACE STATION CAPABILITY

SPACE STATION USER NEEDS



TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS LIFE SCIENCES SUMMARY

- SPACE STATION IS FELT BY MANY TO BE AN ESSENTIAL STEP TO OBTAIN LIFE SCIENCES ANSWERS FOR FUTURE
- LIFE SCIENCES DOES NOT IN ITSELF JUSTIFY MANNED ACTIVITIES IN SPACE; BUT, LIFE SCIENCES RESEARCH IN SPACE IS REQUIRED TO QUALIFY MAN FOR LONG TERM SPACE FLIGHT
- MOST LIFE SCIENCES RESEARCH REQUIRES LONGER THAN 7-14 DAYS AVAILABLE ON SHUTTLE
- PLANNED DEDICATED SHUTTLE/SPACELAB TIME BETWEEN NOW AND 1990 IS ONLY 20 TO 30 DAYS ON ORBIT

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS

— PHYSICAL SCIENCES

— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS



SPACE STATION USER NEEDS



TASK 1.1.2 - COMMERCIAL USER CONTACTS

COMMERCIAL CONTACT SUMMARY

• EXECUTIVES INVITED TO SEMINAR	120
ATTENDED	27
• MEETINGS HELD IN ADDITION TO SEMINAR	
COMMERCIAL USERS - DOMESTIC	18
COMMERCIAL USERS - FOREIGN	11
NASA	15

SPACE STATION USER NEEDS



TASK 1.1.2 - COMMERCIAL USER CONTACTS

A.D. LITTLE/LOCKHEED COMMERCIAL USERS SEMINAR (10 NOVEMBER)

A. PURPOSE:

- INTERACTION NECESSARY TO GAIN COMMERCIAL HIGH LEVEL MANAGEMENT INVOLVEMENT
- IDENTIFY COMMERCIAL INTEREST
- SOLICIT AND DEMONSTRATE NEED FOR USER INTERACTION, SUPPORT AND HIGH TECHNOLOGY INFUSION

B. EXECUTIVES OF 120 LARGE COMMERCIAL ENTERPRISES WERE INVITED TO BOSTON, MASS.

- 27 ATTENDED FROM BROAD SPECTRUM OF NON-AEROSPACE INDUSTRIES
- THERE WAS LIVELY DISCUSSION AND STRONG INTEREST
- FOLLOW-UP VISITS WILL BE MADE ON AN INDIVIDUAL COMPANY BASIS IN DECEMBER AND JANUARY

SPACE STATION USER NEEDS

TASK 1.1.2 - COMMERCIAL USER CONTACTS CONFERENCE AGENDA

COMMERCIALIZING SPACE: THE BARRIERS AND OPPORTUNITIES AGENDA

Tuesday Evening, November 9

6:00-8:00 Welcoming Reception — The Colonnade West

Wednesday, November 10 Meeting — The Embassy Suite

8:30 Coffee

9:00 Opening Remarks Mr. William F. Wright

*Vice President,
Space Systems Division
Lockheed Missiles and
Space Company, Inc.*

Overview Dr. Peter Glaser

*Meeting Chairman,
Vice President, Arthur D. Little, Inc.*

Space Station — Attributes and Needs Mr. John D. Hodge, Director,
Space Station Task Force,
NASA

User Involvement in Space Station Development Dr. Kevin Forsberg, Manager,
Space Station Program,
Lockheed Missiles and
Space Company, Inc.

Working in Space Dr. Gerald P. Carr
Senior Consultant
Applied Research, Inc.

Rationale for Commercial Activities in Space Dr. Peter Glaser

10:45 Break

11:00 Concurrent Seminars Led by Arthur D. Little Technical Staff:

• Utility Services Dr. Philip K. Chapman
Senior Professional Staff

• Materials Processing Dr. Arthur A. Fowle, Consultant to
Arthur D. Little, Inc.

• Telecommunications Mr. Robert S. Gordon
Senior Professional Staff

• Medical Services Dr. Jack Kasten
Vice President

12:00 Luncheon

1:45 Panel and General Discussion Dr. Thomas O. Paine, Moderator
Chairman, Thomas Paine
Associates

- Business factors and highlights including
NASA support of commercial space operations
- NASA handling of proprietary data
- Open discussion

3:45 Summation Dr. Peter Glaser

4:00 Adjournment

Members of Lockheed/Arthur D. Little Study Team will be available for informal discussion.

ORIGINAL PAGE 13
OF POOR QUALITY

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS

— PHYSICAL SCIENCES

— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS



SPACE STATION USER NEEDS



TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS

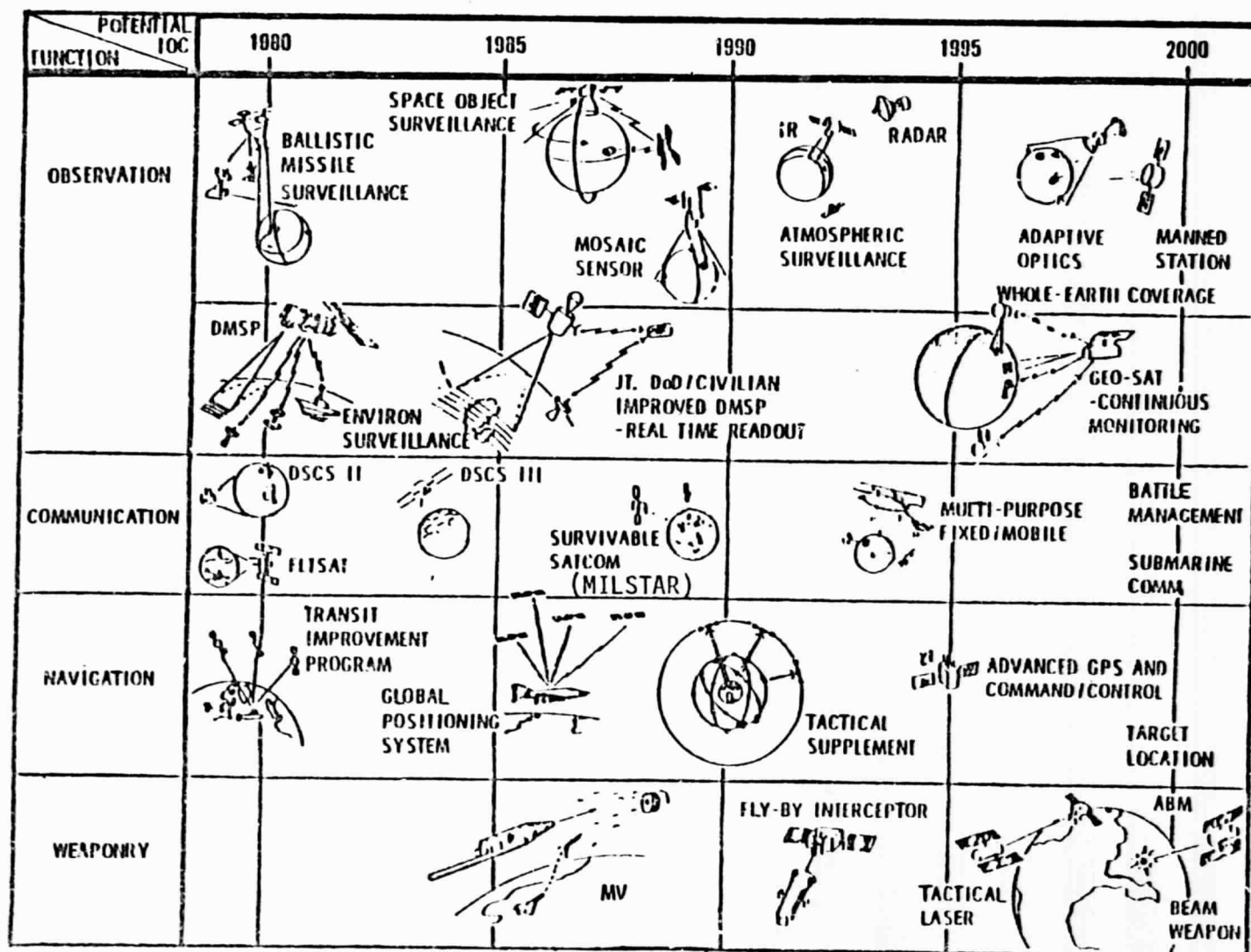
PRIMARY USER CONTACTS	TOTAL NUMBER OF INDIVIDUALS (PRIMARY CONTACTS)	FOLLOW-UP VISITS	
		SECOND	THIRD
AIR FORCE	14	5	2
NAVY	8	5	1
ARMY	9	2	
DARPA	1	1	
DIA	1	1	
OSD	1	1	1
OSAF	3	3	1
TOTAL	37	18	5

NOTE: 60 VISITS WITH 37 PRIMARY CONTACTS

SPACE STATION USER NEEDS

TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS

FUTURE MILITARY MISSIONS*



* AIAA
14 JAN 81

ORIGINAL PAGE 18
OF POOR QUALITY

SPACE STATION USER NEEDS



TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS MILITARY BENEFITS OF SPACE STATION

- RESEARCH AND DEVELOPMENT MISSIONS
 - IMPROVED PROGRAM PERFORMANCE WITH LONGER TIME IN ORBIT
E.G., TALON GOLD
 - SENSOR DEVELOPMENT - MANNED INTERACTION DURING TEST
E.G., NAVY OCEANOGRAPHIC SYSTEMS
- LOGISTICS AND RESUPPLY
 - E.G., REFUEL ATTITUDE CONTROL, MANEUVER PROPELLANTS,
SATELLITE SERVICING (MAINTENANCE AND REPAIR) ON ORBIT
AND LARGE STRUCTURES ASSEMBLY
 - NEED TO EVALUATE SHUTTLE VS. SPACE STATION
- OPERATIONS
 - COMMAND AND CONTROL
E.G., EXTENSION OF NATIONAL MILITARY COMMAND SYSTEM
 - SPACE OBSERVATION

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS

— PHYSICAL SCIENCES

— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS



SPACE STATION USER NEEDS

 Lockheed

TASK 1.1.4 - SPACE OPERATIONS USER CONTACTS

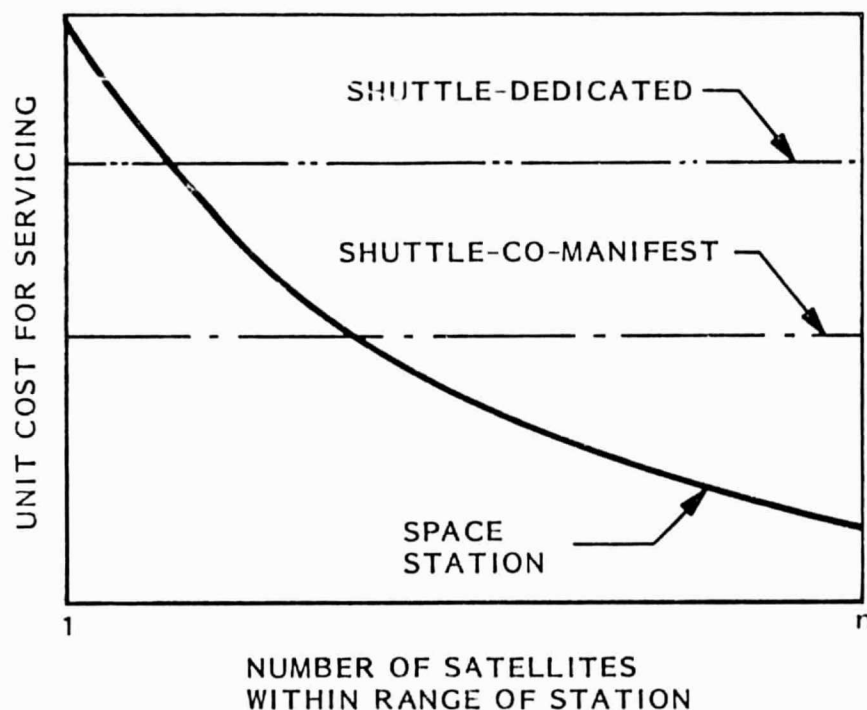
- USERS OF SPACE-BASED OPERATIONS ARE PART OF THE OTHER THREE USER GROUPS (SCIENCE AND APPLICATIONS, COMMERCIAL, AND U.S. NATIONAL SECURITY)
- FIRST-ROUND VISITS WITH POTENTIAL USERS CONCENTRATE ON THEIR SPECIFIC MISSIONS IN SPACE - WITHOUT REGARD, INITIALLY, TO USE OF SHUTTLE OR SPACE STATION
- ONCE THE USER'S END OBJECTIVE IS DEFINED, SUPPORT FOR SPACE-BASED OPERATIONS IS EASIER TO IDENTIFY AND USER SUPPORT IS EASIER TO OBTAIN

THUS

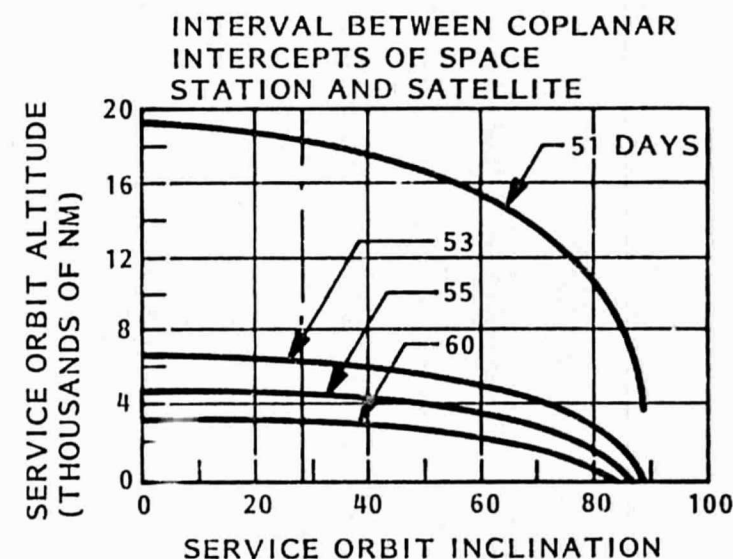
THIS AREA IS BEING EMPHASIZED IN SECOND-ROUND VISITS

SPACE STATION USER NEEDS

TASK 1.1.4 — SPACE OPERATIONS USER CONTACTS



USERS NEED TO BE AWARE OF
ADVANTAGES - AND LIMITATIONS -
OF SPACE-BASED SATELLITE
SERVICING VS SHUTTLE BASED
SERVICING



SPACE STATION LOCATION:

220 NMi
28.5 DEG

NOTE: SHUTTLE CAN BE
LAUNCHED DIRECTLY INTO
PROPER ORBIT PLANE
(INCLINATION AND NODAL
CROSSING)

RESPONSE TIME IS
INFLUENCED BY

- LAUNCH TURNAROUND
- MANIFEST (PRIORITY)

OF POOR QUALITY

11-15-82

- 32 -

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS

— PHYSICAL SCIENCES

— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

 **Lockheed**

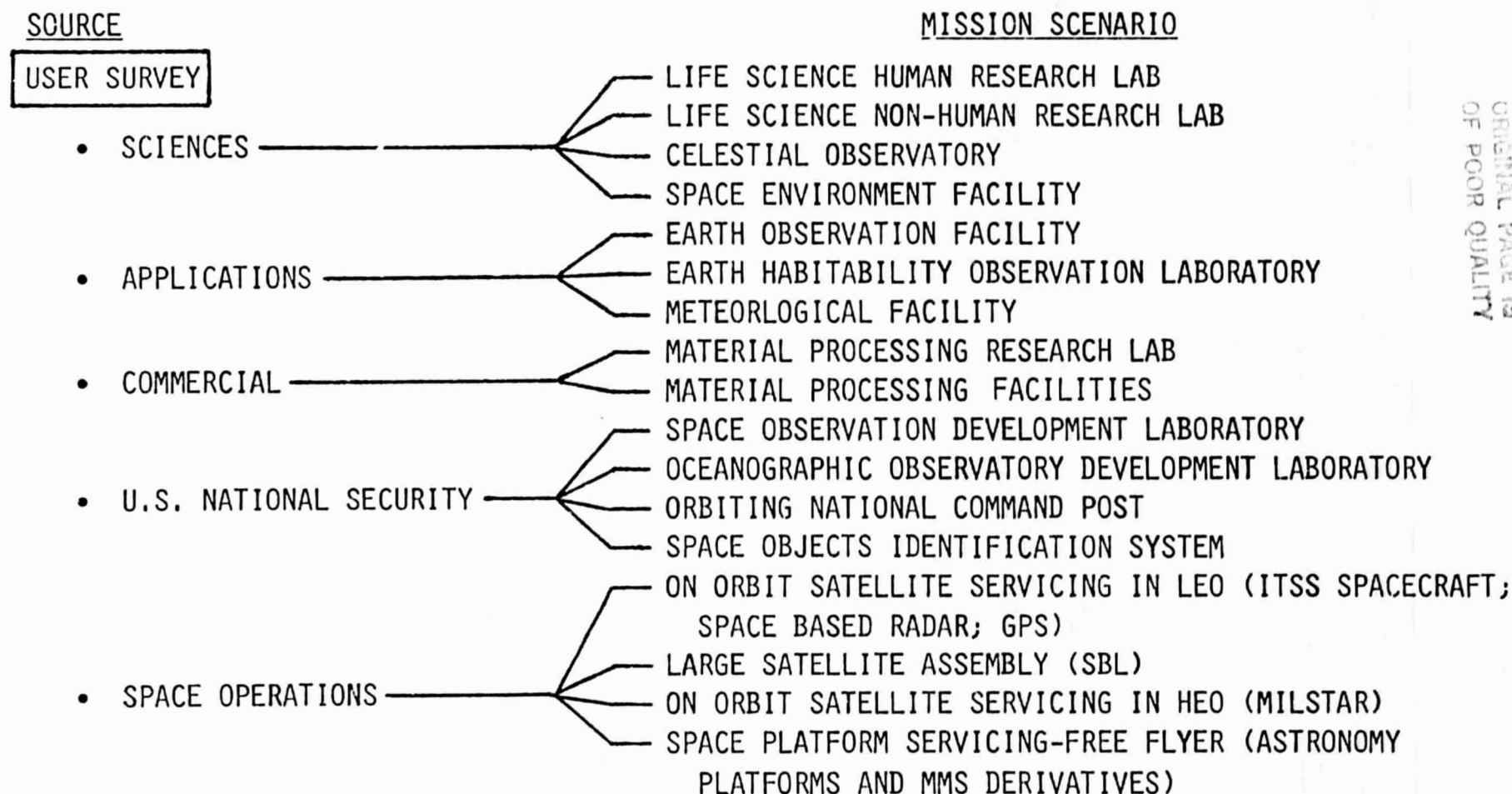
ORIGINAL PAGE 13
OF POOR QUALITY

SPACE STATION USER NEEDS



TASK 1.2 - REQUIREMENTS FROM USER NEEDS

DEVELOPMENT OF PAYLOAD ACCOMMODATION MISSIONS FROM USER SURVEY



ORIGINAL PAGE 13
OF POOR QUALITY

11-15-82

- 34 -

SPACE STATION USER NEEDS



TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL DEVELOPMENT USER MISSION SCENARIO

"OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB"

SPACE STATION USER NEEDS



TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB"

MISSION CATEGORY: U.S. NATIONAL SECURITY

SYSTEM/PROGRAM: OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LABORATORY

OBJECTIVE:

- TO DEVELOP MULTI-SENSOR SYSTEMS AND EXPAND EXISTING CAPABILITIES
- TO PROVIDE MEANS FOR EXTENDED TIME REAL TIME OBSERVATION OF DYNAMIC OCEAN PHENOMENA AND CONTROL OF SENSOR POINTING AND DUTY CYCLES
- TO CORRELATE VISUAL OBSERVATIONS IN SPACE AND DATA FROM VARIOUS SENSORS
- TO PROVIDE MEANS TO REDUCE DEVELOPMENT COSTS AND TO MINIMIZE DEVELOPMENT SPANS BY MAKING USE OF MANNED CAPABILITIES
- TO PROVIDE DATA TO EVALUATE ROLE OF MAN IN AN OPERATIONAL ENVIRONMENT

SYSTEM DESCRIPTION:

LIFETIME: 3 TO 6 MONTHS PER EXPERIMENT SEQUENCE

10 YEAR USEFUL OPERATION

LAUNCH VEHICLE: SHUTTLE

TRANSFER VEHICLE: NONE REQUIRED FOR SPACE STATION SORTIE MISSIONS

TMS REQUIRED FOR CLUSTER-FREE-FLYER

OPERATIONAL LOCATIONS: 300 - 700 km AT 65° PREFERRED

300 km AT 28.5° USEFUL

SPACE STATION USER NEEDS



TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB" (continued)

SYSTEM DESCRIPTION: (cont')

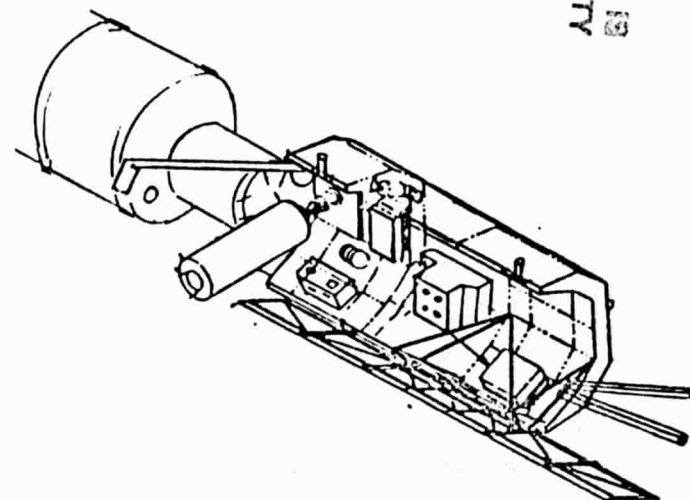
TOTAL MASS AT OPERATIONAL LOCATIONS: TBD (BUT LESS THAN 14,000 kg)

AVERAGE OPERATIONAL POWER: TBD (BUT LESS THAN 5 kW)

DESIRED INITIAL OPERATIONAL DATE: 1988 (SHUTTLE BASED EXPERIMENTS)
1990 (SPACE STATION BASED EXPERIMENTS)

GENERAL NEEDS:

- EQUIPMENT TO BE MOUNTED ON EXISTING PALLET (E.G., ESS OR SPACELAB PALLET)
- LABORATORY IS TO BE CAPABLE OF SUPPORTING EXPERIMENTAL (BRASSBOARD) HARDWARE AND SENSORS
- PHYSICAL CHARACTERISTICS:
 - 30ft x 14ft DIAMETER
 - UP TO 40ft ANTENNA (SORTIE) EXPANDABLE OR UNFOLDABLE
 - UP TO 300ft ANTENNA (FREE FLYER)
- OPERATIONAL CREW:
 - 2 EXPERIMENTORS MINIMUM (NO EQUIPMENT MODS)
 - 10-MAN CREW (TECHNICIANS)
- DATA: ON-BOARD DATA PROCESSING, $\sim 10^3$ MBPS



ORIGINAL PAGE IS
OF POOR QUALITY

SPACE STATION USER NEEDS

TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB" (continued)

CONTACTS:

RADM. J. MOONEY	CHIEF OCEANOGRAPHER, U.S. NAVY, WASH. D.C.	202/254-4318
CDR. D. HONHART	ASST. ENVIRON. SAT., WASH. D.C.	202/254-4562
DR. R. STEVENSON	ONR, SCRIPTS INSTITUTE OF OCEANOGRAPHY	714/452-3012
CAPT. W. PEIRCE	DEPUTY DIRECTOR, NAVY SPACE	202/697-0761
CDR. D. DIAZ	OFFICE OF NAVY SPACE	202/695-5323

11-15-82

- 38 -

SPACE STATION USER NEEDS

 Lockheed

U. S. NATIONAL SECURITY
OPERATIONAL MISSION

ORBITING NATIONAL COMMAND POST

(PRESENTED IN CLASSIFIED SECTION)

SPACE STATION USER NEEDS



TASK 1.2 - REQUIREMENTS from USER NEEDS

TYPICAL OPERATIONAL SCENARIO: "ORBITING NATIONAL COMMAND POST" (continued)

CONTACTS:

MR. C. FORSYTHE	STAFF SPECIALIST, SPACE & ADV. SYS. OUDRE, PENTAGON	202/697-8157
DR. C. COOK	DEP. UNDER SEC., AF, PENTAGON	202/695-2317
COL. J. FOSTER	SAF/ALS, PENTAGON	202/697-6827
LCOL. R. M. McCORMICK	SPECIAL ASST. TO DIRECTOR, DARPA, PENTAGON	202/697-4436
LCOL. J. ANGELL	DEP. CHIEF, XOSX, PENTAGON	202/697-0649
MAJ. D. NEWBERN	HQ., AFSC/XR, ANDREWS AFB	301/981-3267
COL. J. HEILMANN	HQ., SAC/XPF, OFFUT AFB	402/294-5157
MAJ. H. RAINEY	HQ., SAC/XPF, OFFUT AFB	402/294-5157
COL. C. HEIMACH	C ² & RECON. DIV., USAF STRAT FORCE ANALYSIS	202/695-0547
MR. G. WARNER	DIA, DC-3, PENTAGON	202/697-5227

SPACE STATION USER NEEDS

TASK 2

MISSION IMPLEMENTATION CONCEPT



SPACE STATION USER NEEDS

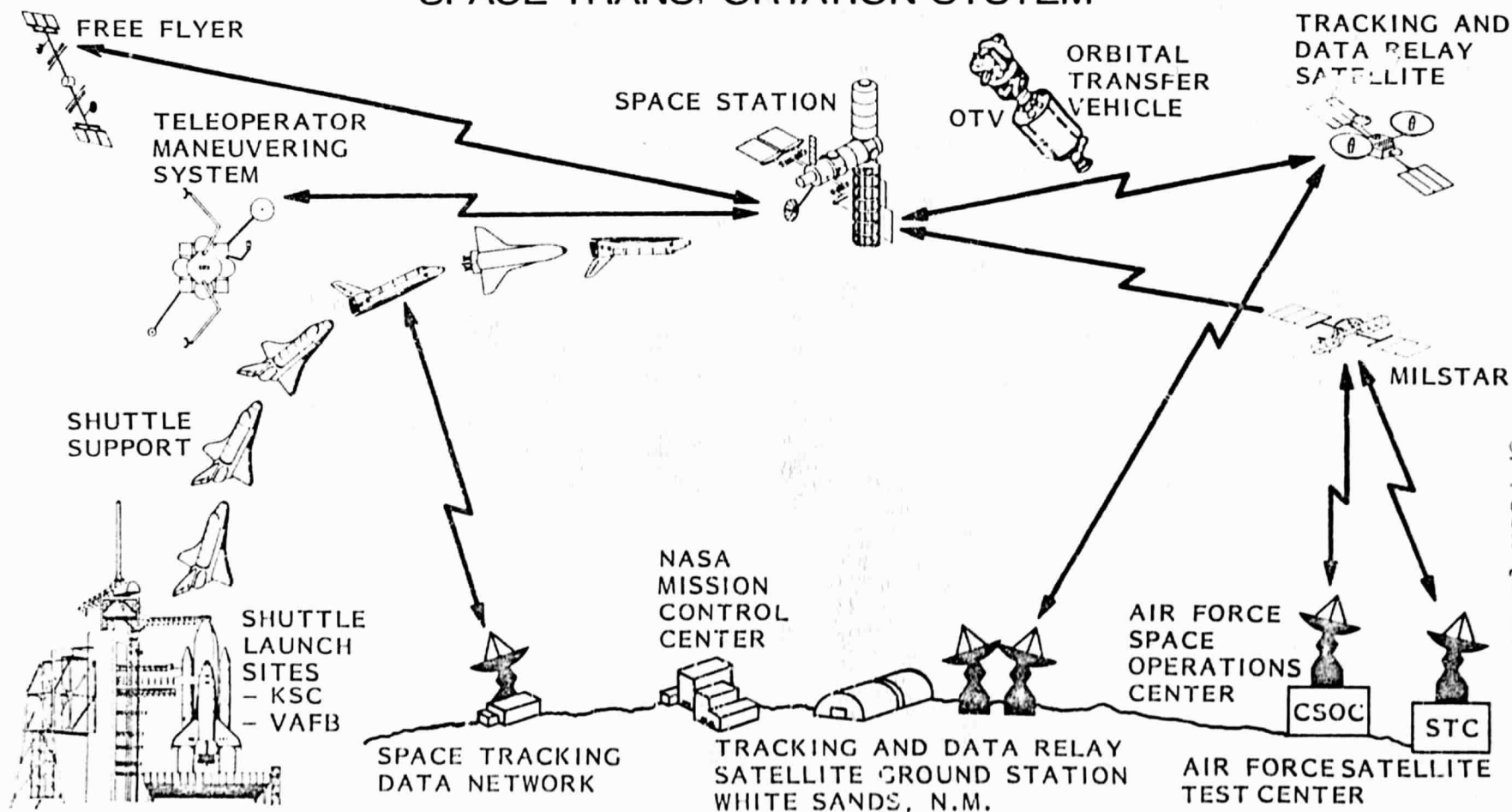
TASK 2 - MISSION IMPLEMENTATION CONCEPTS

- BASIC SPACE STATION COMPONENTS HAVE BEEN ENTERED INTO CADAM TO ALLOW EASY MANIPULATION AND MODIFICATION OF ARCHITECTURAL CONCEPTS
- WORK HAS BEEN INITIATED TO EVALUATE EACH OF THE COMPLETED MISSION SCENARIOS (17) AND TO DEFINE ARCHITECTURAL OPTIONS CAPABLE OF SUPPORTING THE USER NEEDS

SPACE STATION USER NEEDS



TASK 2 — MISSION IMPLEMENTATION CONCEPTS SPACE TRANSPORTATION SYSTEM



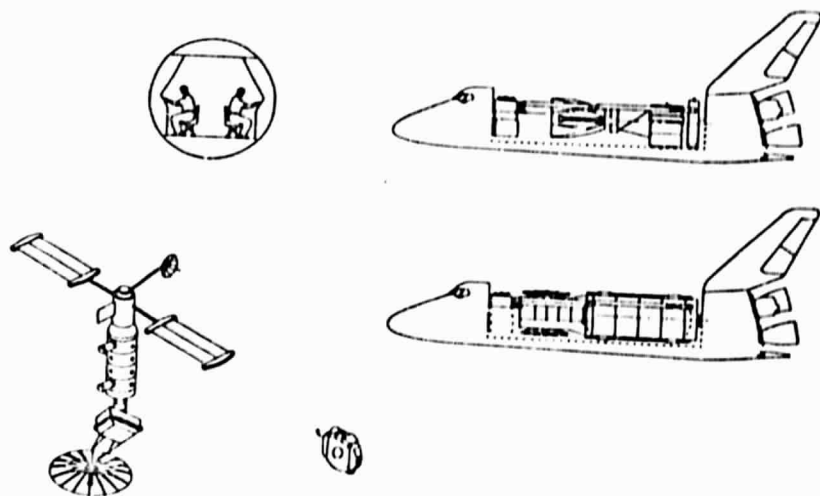
ORIGINAL PAGE 10
OF POOR QUALITY

SPACE STATION USER NEEDS

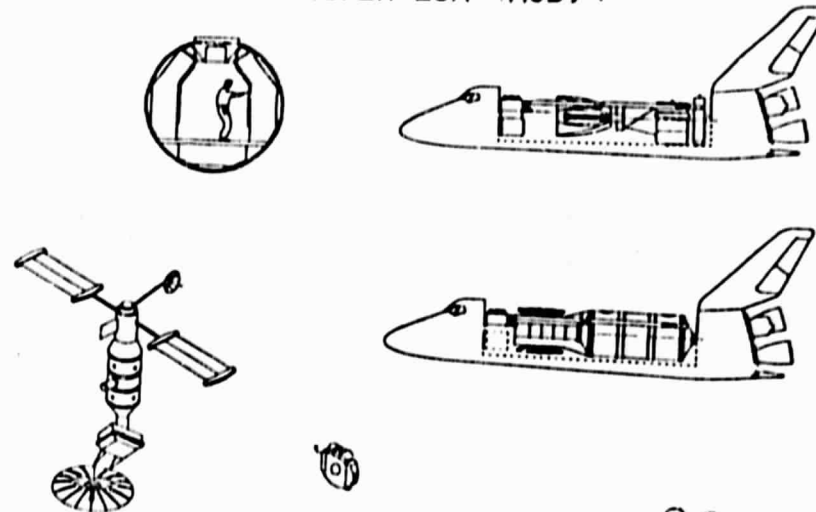


TYPICAL ARCHITECTURAL OPTIONS

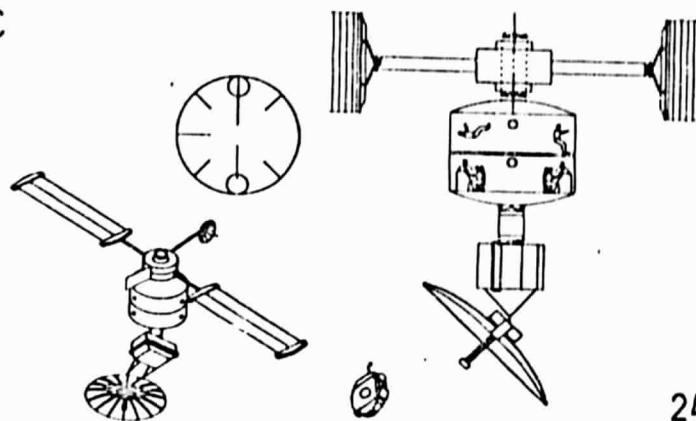
A 12 ft DIAMETER (NEW)



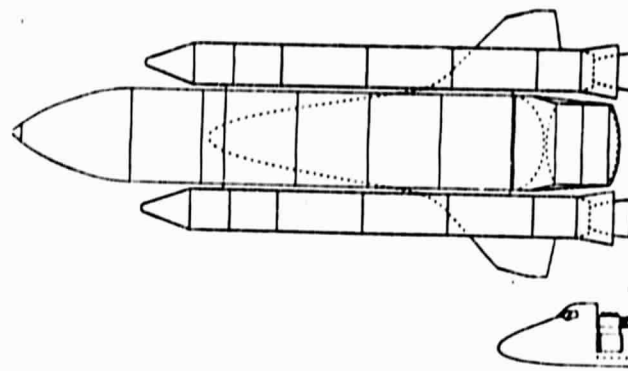
C 14 ft DIAMETER ESA (MOD)



C



24 ft DIAMETER ET (NEW)



ORIGINAL PAGE IS
OF POOR QUALITY

SPACE STATION USER NEEDS



TASK 2 — MISSION IMPLEMENTATION CONCEPTS SPACE STATION EVOLUTION

SPACE STATION—PHASE IV

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1996	END OPERATIONS	EXPANDED C ³ I	NUCLEAR POWER	MAY INCLUDE MAIN STATIONS IN CRITICAL ORBITS WITH SMALL OUTPOST STATION EQUALLY SPACED
2000	C & C MARON DELIVERY	ESCAPE CAPSULE LARGE CREW IMMUNITING	HIGH THRUST PROPULSION SHIELDING ON-LOCATED DEFENSE	

SPACE STATION—PHASE III

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1995	INSTALLING & SERVICING	CAPABILITY TO TRANSFER	MAIN LEO STATION &	MAINTENANCE SCHEDULE WILL ESTABLISH FREQUENT, PROBABLY VISITS

SPACE STATION—PHASE II

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1993	SATELLITE SERVICING	DOCKING FOR: SPACECRAFT	ENCLOSED OR OPEN HANGERS & WORK PLATFORMS	HOW MUCH EVA CAN BE EXPECTED - WILL ENCLOSED WORK STATIONS BE REQUIRED?
1994	OTV SERVICING	OTV TMS	EXTENT OF TESTING OF OTV/	

TE TAKE FARM ON
ARGE LASER BATTLE

SPACE STATION—PHASE I

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1990	SCIENCE & APPLICATION EXPERIMENTS	HABITAT	NUCLEAR OR SOLAR POWER	MUST BE CAPABLE OF USING EITHER SOL OR NUC PERHAPS TIME PHASED
		POWER	SEPARATE HANDED LAB	INTERNAL LAUNCH SENSOR VIEWING/PORTS ACCESS TO SPACE
	END RE D COMMERCIAL PROCESSING EXPERIMENTS	EXPERIMENT SUPPORT	FIXED EXPERIMENT PALLET	HAN TENDED
		COMMUNICATIONS	ISOLATED EXPERIMENT PALLET	ISOLATED PALLET REQUIREMENTS PROBABLY SATISFIED OR HANDLED BY EXISTING TETHERED PALLET
	OPERATIONAL EXPERIENCE	ENVIRONMENT	SEPARATE OR INTEGRAL C & DH CAPSULE	USE OF ESA SPACE LAB EUREKA
		ZERO G LOW CONTAMINATION	EMERGENCY SHELTER	HOW CAN ELECTRONICS BE UPDATED OR REPAIRED - IN ORBIT OR GROUND HOW LONG? SHOULD IT HAVE A RE-ENTRY CAPABILITY - (SHUTTLE DISASTER)

RE VOLUME FOR SPARES?

REQUIREMENT FOR LOCAL
(SPORTATION)

AND RANGE WITH
IF FUEL?

ORIGINAL PAGE 19
OF POOR QUALITY

SPACE STATION USER NEEDS

TASK 3

COST AND PROGRAMMATIC ANALYSIS



SPACE STATION USER NEEDS

STATUS OF COST AND PROGRAMMATIC ANALYSIS

WORK BREAKDOWN STRUCTURE

- SSCAG STANDARD WBS TAILORED

SPACE STATION COST MODEL

- PROGRAM LISTING ACQUIRED
- PROGRAMMED ON TELEVIDEO 860 MICROCOMPUTER
- TEST CASES RUN

PRICE MODEL

- TEST CASES RUN ON SPACE STATION MODULE
- COST AND SCHEDULE DATA DERIVED

COST/SCHEDULE ESTIMATION APPROACH FORMULATED

- MODEL OUTPUTS EVALUATED
- STRENGTHS OF EACH MODEL COMBINED

BENEFITS TERMINOLOGY AND TOOLS IN PLACE

11-15-82

- 47 -

SPACE STATION USER NEEDS

FOREIGN CONTACTS

 *Lockheed*

SPACE STATION USER NEEDS



INFORMATION EXCHANGE AGREEMENTS

AGREEMENTS AT NO COST WERE FORMALIZED WITH:

SPAR	-	TORONTO, CANADA
GTS	-	LONDON, ENGLAND
ERNO/MBB	-	BREMEN, MÜNCHEN - GERMANY
DORNIER	-	FRIEDRICHSHAFEN - GERMANY

VISITS PLANNED 6 TO 17 DEC.:

GTS	-	LONDON
ERNO/MBB	-	BREMEN/MÜNCHEN
DORNIER	-	FRIEDRICHSHAFEN
ESA	-	PARIS
ONERA	-	PARIS
TNO	-	DELFT
FOKKER	-	AMSTERDAM
DFVLR	-	KÖLN
ESTEC	-	NOORDWYK
MINISTRIALRAT DEUTSCHLAND - BONN		

11-15-82
- 49 -

SPACE STATION USER NEEDS

STATUS

CONCLUSIONS

OBSERVATIONS

PLANS FOR COMPLETION

 **Lockheed**

SPACE STATION USER NEEDS

STUDY STATUS

- OVER 200 USER CONTACTS MADE
- DISCRETE USER DATA OBTAINED VIA THE FORMAL USER CONTACTS TO DATE
- USERS HAVE AS YET PROVIDED ONLY GENERAL REQUIREMENTS
- 17 SCENARIOS DEVELOPED FOR USER CONSIDERATION
- SOME 250 SCIENCE MISSIONS HAVE BEEN ENTERED INTO DATABASE
- CONCEPTUAL STATION ARCHITECTURAL APPROACHES HAVE BEEN IDENTIFIED

SPACE STATION USER NEEDS



CONCLUSIONS

- APPROACH TO USER CONTACTS (BROAD BASE, SMALL GROUPS, REPEAT VISITS) IS TIME CONSUMING, BUT IS BEGINNING TO BEAR FRUIT
- CONTACTS ARE RESULTING IN A NEW AWARENESS WHICH SHOULD STIMULATE POTENTIAL SPACE STATION USE
- REQUIREMENTS DATA AVAILABLE FROM USERS IS VERY LIMITED
- IF STATION EXISTS, IT WILL BE USED BY MANY
- A FEW KEY SPACE STATION UNIQUE MISSIONS HAVE BEEN IDENTIFIED
- SEVENTEEN MISSION SCENARIOS ARE IN PROCESS: FIVE HAVE BEEN REVIEWED - AND ACCEPTED - BY USERS
- SIGNIFICANT U.S. NATIONAL SECURITY STATION INTEREST HAS BEEN CREATED BY ONE-ON-ONE AND SMALL GROUP INTERACTIONS

SPACE STATION USER NEEDS



OBSERVATIONS

- STUDY ACTIVITY AND CONTACTS IN BOTH COMMERCIAL AND DoD AREAS ARE STIMULATING CLOSE SCRUTINY OF MANNED SPACE STATION WHICH SHOULD RESULT IN A REALISTIC ASSESSMENT OF THE PROGRAM REQUIREMENTS

AS WE HAVE VISITED AND REVISITED POTENTIAL USERS
INTEREST HAS INCREASED AND A PERCEPTIBLE MOMENTUM
FOR SUPPORT OF SPACE STATION IS OBSERVED

- THERE IS A GENERAL ACCEPTANCE OF STATION FOR R&D WHICH WOULD SUPPORT DEVELOPMENT OF AUTOMATED SYSTEMS
- OPERATIONAL NEEDS FOR A SPACE STATION HAVE BEEN IDENTIFIED BUT CONSIDERABLE EFFORT IS REQUIRED TO ESTABLISH AND MAINTAIN USER INVOLVEMENT AND SUPPORT
- SATELLITE SERVICING FUNCTION FROM STATION MUST BE EVALUATED VIS-A-VIS SHUTTLE-BASED SATELLITE SERVICING
- THE PROCESS OF DEVELOPING USER SUPPORT REQUIRES MULTIPLE VISITS AND A LONG-TERM FOLLOW-THROUGH

SPACE STATION USER NEEDS



PLAN FOR STUDY COMPLETION

15 NOVEMBER 1982 - 20 FEBRUARY 1982

- CONTINUE POTENTIAL USER CONTACTS
- CARRY OUT FOREIGN CONTACT PLAN AS PRESENTED
- FINALIZE MISSION SCENARIOS WITH USER ASSISTANCE
- FINALIZE TIME-PHASED SPACE STATION MISSION REQUIREMENTS
- DEVELOP INITIAL AND ULTIMATE SPACE STATION ARCHITECTURE
- PERFORM COST ANALYSES OF INCREMENTAL CAPABILITY
- DEFINE TIME-PHASED COSTS
- CONDUCT BENEFITS ANALYSES